

Oct. 26, 1943.

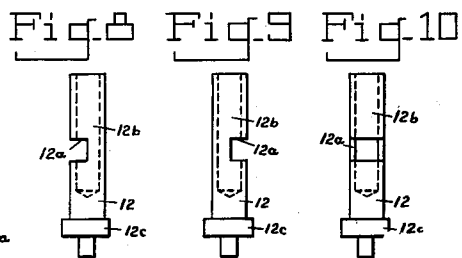
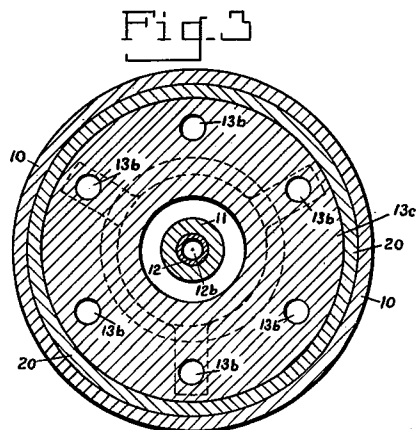
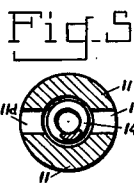
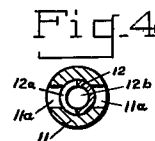
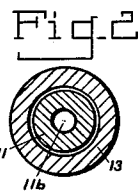
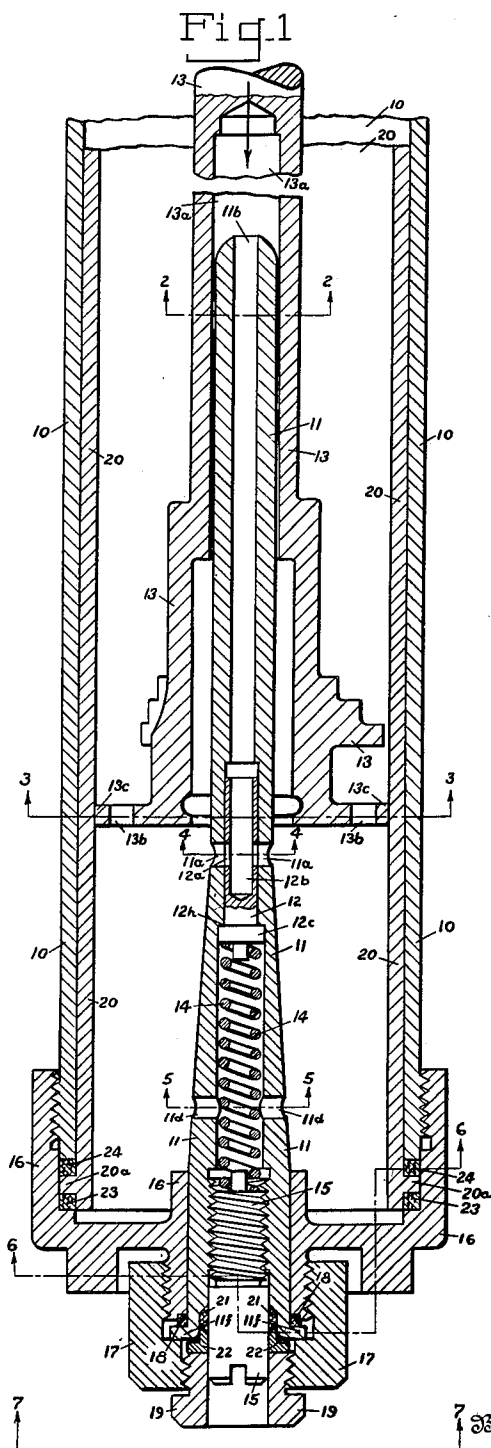
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2,332,520

VARIABLE BUFFER

Filed May 18, 1942

3 Sheets-Sheet 1



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Fig. 6

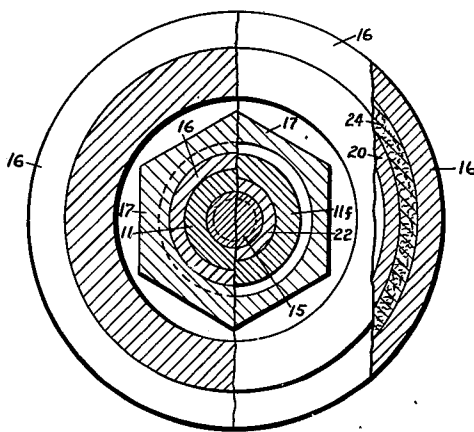
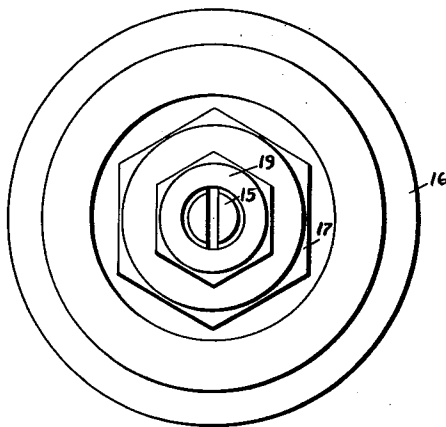


Fig. 7



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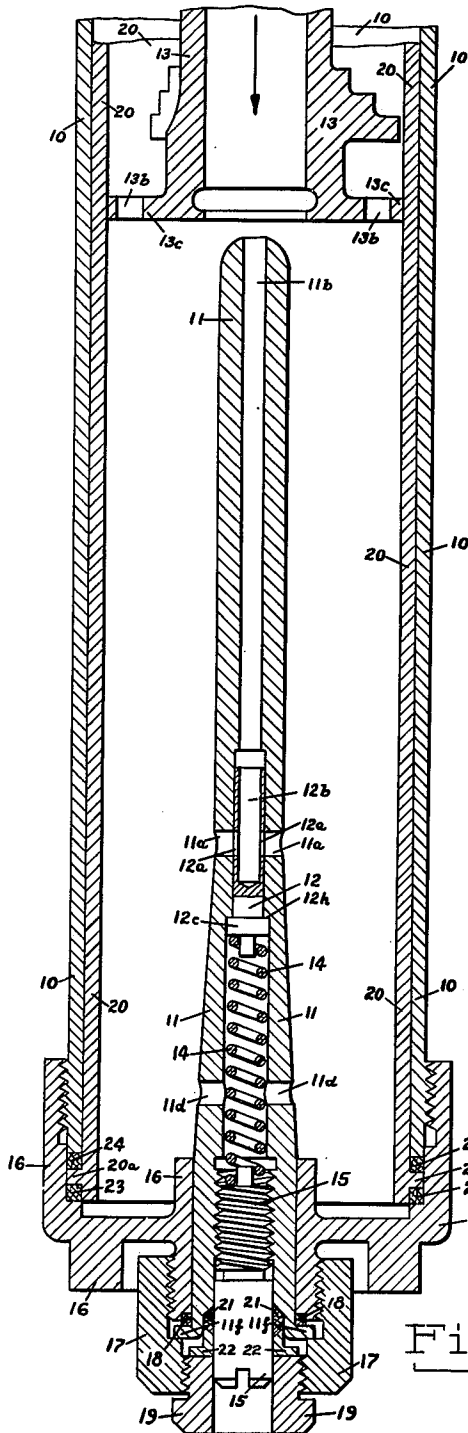


Fig. 1

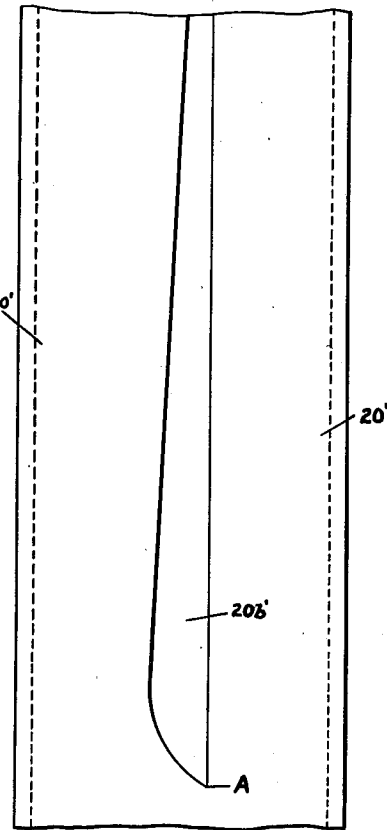


Fig. 12

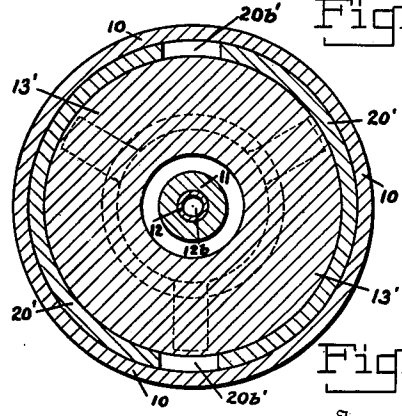


Fig. 11

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UNITED STATES PATENT OFFICE

2,332,520

VARIABLE BUFFER

Victor F. Lucht, Washington, D. C.

Application May 18, 1942, Serial No. 443,419

5 Claims. (Cl. 188—94)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to a buffer assembly particularly for use with a gun.

An object of this invention is to provide a buffer which produces the same equal controlling effect on a movable gun part irrespective of the firing position of the gun, i. e., the same effect is produced in maximum elevation as in maximum depression.

Another object of this invention is to provide a compact and simple arrangement of parts in a buffer mechanism and wherein the buffer effect produced is constant irrespective of whether the gun is fired at maximum elevation or at maximum depression.

The specific nature of the invention as well as other objects and advantages will clearly appear from a description of a preferred embodiment as shown in the accompanying drawings in which:

Fig. 1 discloses a longitudinal fragmentary section through the center of the buffer mechanism when the piston 13 is at one end of its recoil stroke.

Figs. 2, 3, 4, 5 and 6 are sectional views taken substantially on corresponding lines in Fig. 1.

Fig. 7 is an end view taken substantially in the direction 7—7 of Fig. 1.

Fig. 8 is a side elevation of valve body 12.

Fig. 9 is a side elevation of the valve body 12, taken on the side opposite that shown in the preceding figure.

Fig. 10 is a plan view of the valve body 12.

Fig. 11 discloses a section of a modified structure which is similar to the section shown in Fig. 3 but with the piston 13' displaced a small amount from its end position.

Fig. 12 is a side elevation view of a portion of the modified sleeve 20' shown in Fig. 11. The point indicated by A in this figure corresponds to the end position of piston 13; said end position corresponding to the end position of the piston as shown in Fig. 3.

Fig. 13 discloses a fragmentary sectional view through the center of the buffer mechanism when the piston 13 is about to come into cooperating relationship with buffer 11 as the piston 13 returns from one of its extreme positions (not shown) to the other extreme position shown in Fig. 1.

The buffer assembly disclosed herein comprises the following essential elements: stationary in-

closing cylinder 10 carrying the stationarily mounted buffer 11 and which contains therein movable piston 13 attachable to a movable gun part (not shown) at the upper end of Fig. 1, and a movable valve body 12 spring biased and slidably mounted in the buffer 11. Sleeve 20 of steel or bronze and preferably of steel is centrally mounted in cylinder 10 and provides a bearing surface for outer portions of piston head 13c. The piston outer portions 13c are preferably of soft antifriction material. Piston 13 besides being disposed in sliding relationship to stationary sleeve 20, slides over stationary buffer 11.

The inclosing cylinder 10 is maintained filled with oil or other similar fluid from a suitable reservoir (not shown). Piston apertures 13b allow relative unrestricted fluid passage to opposite sides of piston head 13c as the piston 13 moves in sleeve 20. Or, in the modification shown in Figs. 11 and 12 diametrically disposed holes 20b' in sleeve 20' cooperate with solid piston head 13' in providing a variable orifice for the flow of oil to opposite sides of piston head 13c'; each one of the two diametrically disposed sleeve holes 20b' are designed so as to offer a variable aperture of such dimensions whereby the piston head 13c' tends to move at variable speed even though constant forces are applied to the piston as it moves.

When piston 13 is stationary or when buffer 11 enters piston hollow portion 13a with a relative initial velocity (in a direction indicated by the arrow in Fig. 1) below a predetermined value, corresponding to the initial velocity at maximum gun elevation, the fluid in piston hollow portion 13a has free access to the fluid surrounding buffer 11, due to the fact that a valve body notch 12a is aligned with buffer port 11a whereby fluid may flow from piston hollow portion 13a through buffer passage 11b, valve body hollow portion 12b, valve body notch 12a, and through buffer port 11a. The valve body notch 12a is normally aligned with buffer port 11a, as in Fig. 1, due to coil compression spring 14, which acts between the valve body shoulder 12c and adjustable screw 15. Buffer shoulder 12h limits longitudinal movement of valve body 12. Valve body notch 12a is so designed that when it is in its normal aligned position the amount of oil flow there-through is constant regardless of the angular position of valve body 12 with respect to buffer 11, i. e., it is not necessary to provide guides between valve body 12 and buffer 11.

The fluid pressure in piston chamber 13a varies as a function of the initial velocity imparted to the piston 13 in its motion indicated by the arrow

in Fig. 1. And, also the velocity imparted to piston 13 due to movement of gun part (not shown) is a function of the angle of fire of the firearm, since the gravitational forces on the gun parts are different at different angles of fire. Accordingly, valve body 12 is designed and spring biased so as to provide variable compensatory effects for the variable initial velocities imparted to piston 13 at the different angles of fire. For example, in applicant's particular gun, the initial relative velocity with which piston 13 comes into cooperating position with fixed buffer 11 increases with depression angles and decreases with elevation angles. Valve body 12 is normally held in the open position by spring 14, the tension of which is regulated by screw 15. Buffer port 11d allows fluid flow therethrough as valve body 12 moves. The ports and channels from piston chamber 13a to the space surrounding piston 13 are such that the valve body 12 remains in fully open position when firing at maximum elevation, and spring or resilient means 14 is tensioned such that the valve body 12 is fully closed when firing at maximum depression; when firing at maximum depression, most of the oil leakage is between the inner walls of piston 13 and adjacent loosely fitting buffer walls. For angles of fire between maximum elevation and maximum depression the valve body 12 closes buffer port 11a in proportional relationship.

The cylinder 10 is closed at its bottom end in Fig. 1 by a screw threadedly mounted cover 16 thereon with rings of fluidtight packing 23 and 24 interposed between sleeve shoulder 22a and adjacent portions of the cover 16 and adjacent end of cylinder 10, respectively. Buffer 11 is centrally held on cover 16 by means of nut 17, which is screw threaded on cover 16 so as to engage buffer flange 11f and compress the ring of fluidtight packing material 18. The adjusting screw 15 is screw threadedly mounted on buffer 11 and a second nut 19 screw threadedly mounted on the first nut 17 compresses bushing 22 against packing 21, so as to provide a fluidtight connection between the adjusting screw 15 and buffer 11.

The upper end of cylinder 10 shown in Fig. 1 is closed by means (not shown), but in a manner similar to that shown above for the lower end and an oil breathing chamber or reservoir (not shown) is connected so as to maintain cylinder 10 full of oil.

It is noted that the notch 12a in valve body 12 has an opening approximately equal to the diameter of port 11a, and that the notch extends the full diameter of port 11a so that the valve body 12 closes buffer port 11a after the valve body is moved a distance approximately equal to the diameter of port 11a. Other possible notch configurations might be suggested to one skilled in the art and may function equally well, but the particular notch configuration as disclosed by applicant is his preferred embodiment and does not require guide members for preventing rotation of valve body 12.

This invention relates primarily to operating forces and means placed in operation when buffer

11 initially enters the hollow portion of piston 13 in a direction indicated by the arrow in Fig. 1 and as the piston moves in that direction when in surrounding relationship to buffer 11. When and as the piston 13 moves in a direction opposite to that indicated by the arrow in Fig. 1 valve 12 remains open at all angles of fire and relative unrestricted fluid flow occurs through buffer port 11a, as the buffer 11 separates from surrounding relationship to piston 13; and, when piston 13 moves out of surrounding relationship to buffer 11, of course, fluid may flow directly into piston hollow portion 13a.

I claim:

1. In a buffer assembly, a cylinder, a buffer centrally mounted in the cylinder, a piston slidable in the cylinder and having a hollow portion adapted to receive the buffer, said buffer having a passageway extending therethrough in communication with the piston hollow portion, and a pressure responsive valve in the buffer passageway intermediate its ends and controlling a passage of fluid between said passageway and the buffer end of the cylinder.

2. In a buffer assembly, a cylinder, a buffer centrally mounted in the cylinder, a piston slidable in the cylinder and having a hollow portion adapted to receive the buffer, said buffer having a passageway extending therethrough in communication with the piston hollow portion, a pressure responsive valve in the buffer passageway intermediate its ends and controlling the passage of fluid between the buffer passageway and the buffer end of the cylinder, and means for varying the operable pressure range of the valve.

3. In a buffer assembly, a cylinder, a buffer centrally mounted in the cylinder, a piston slidable in the cylinder and having a hollow portion adapted to receive the buffer, said buffer having a passageway extending therethrough in communication with the piston hollow portion, a cover for one end of the cylinder, an adjusting screw centrally mounted on the cover, a valve body slidably mounted in the buffer passageway intermediate the ends of said passageway and controlling a passage of fluid between said passageway and the buffer end of the cylinder, and resilient means disposed between the adjusting screw and valve body.

4. A fluid cylinder, a fluid piston having a hollow portion and slidably mounted in the cylinder, a cover for one end of the cylinder and having an aperture therethrough, a buffer having a flange and extending through the cover aperture into the piston hollow portion, said buffer having a longitudinal passage therethrough, a valve body slidable in the buffer longitudinal passage, a nut threaded on the cover and pressing the buffer flange against the cover, an adjustment screw threaded in the buffer longitudinal passage, and resilient means between the valve body and adjustment screw.

5. The same as in claim 4 and a second nut threaded on the first mentioned nut and packing material between the second nut and the adjustment screw.

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